II

SCIENCE AND PUBLIC HEALTH

PUBLIC HEALTH is a modern term which serves to designate that phase of medical science which concerns itself primarily with the group rather than the individual member of society. According to the present conception, a health problem becomes a public responsibility when it can be controlled only by systematized social action. The most common health problems falling within the scope of the public health program are the communicable diseases, the preventable diseases whether communicable or not, and those health or life hazards which are sufficiently widespread to affect a significant portion of the population. Public health practices had their beginning at the very dawn of civilization. They arose out of the health needs of the people and have developed along with numerous other folk activities incidental to life and living. At no time in the history of its development has the quality of the public health program progressed beyond the intellectual capabilities of the individuals for whom it was intended. The history of the development of the public health movement, therefore, may serve as a sounding board to reflect the life, customs, and scientific attainments of society at any particular period in the history of civilization.

Students of folklore are universally agreed that there is a common point of identity in the myths, superstitions, and religious ceremonies of all primitive peoples. Under different aspects of time and space primitive practices have been

strangely alike, differing only in unimportant details. The common point of convergence in folk-medicine was the belief that disease was a manifestation of the wrath of God, or of some human enemy with supernatural powers. The cure of disease, or its prevention, was therefore closely associated with moral reform, and thus fell within the prescribed duties of the priests. The untutored folk-mind was prone to regard the natural as the supernatural; it confused life with motion and assigned causal relationships to accidental occurrences. In the treatment of illness the primitive physician assumed a directive control over disease somewhat similar to that of the priest in relation to religion. By means of mysterious incantations, and the assumption of various terrifying aspects, the demons of disease were frightened away. To prevent a recurrence of the disease the patient was given a charm to be worn or carried on his person. Throughout this ordeal the patient was no doubt entertained and amused while nature proceeded to cure the disease or kill the victim.

The ancient Hebrews were probably the founders of organized public health. As recorded both in the Talmud and the Bible, the Jewish priests served as hygienic police in relation to contagious diseases, and thus may be considered the first public health officers. Detailed codes for hygienic living are set forth in the Bible. These mandates give directions to the priests as to the method of diagnosing leprosy and other bodily ailments. They prescribe a code to be followed in relation to the proper food to be eaten, the handling of unclean objects, and other matters of personal and community hygiene. In addition they give specific directions for the prevention of contagious diseases, segregation, disinfection, and the proper disposal of bodily wastes and the clothing of diseased persons. It is not to be assumed, however, that the early Hebrews were familiar with the causative agents of

disease or with scientific methods of treatment. As in the case of all healers before them, they relied on superstitious rituals and sacrificial offerings to secure the desired results.

Without the development of the scientific method there would have been little progress in the field of public health. Since science rests on the painstaking recognition of uniformities in nature, the methods of science began when man first learned to record the passage of time. He was thus enabled to plan ahead for the various seasonal activities necessary to life and thereby organize and systematize his mode of living. The development of science, therefore, became an integral part of the common life of mankind and its history is coextensive with that of civilized living. Science is organized workmanship and its ultimate goal is truth. The methods of science separate belief or assumption from fact. They demand accuracy and objectivity in experimentation and observation, and permit interpretation and conclusion only if substantiated by fact. The development of science has never been continuous, nor even progressive, and those who have sought truth through the methods of science have experienced tremendous difficulties. In early civilization the same individual served as physician, scientist, and priest. Because the personal fortunes of the priests rose or fell according to their alleged ability to control the forces of nature, it was advantageous for them to stage dramatic performances for their clientele. Consequently magic came to be inseparably interwoven with science. To the untutored mind pseudoscience was undoubtedly more spectacular than the genuine article and therefore more acceptable. Since the moral leaders were able to exert considerable control over public opinion, they often retarded the advance of scientific ideas and frequently developed into fanatical overlords who oppressed mankind and kept them permanently ignorant and super-

stitious. "Ideas of the greatest scientific moment have been throttled at birth or veered into blind alleys through some current prepossession or deprived of their chance of fruition through human indifference, narrow mindedness, or other accidental circumstances."[1]

The history of the advancement of medicine, and therefore public health, is the . . . "history of the discovery of a number of important fundamental principles leading to new views of disease, to the invention of new instruments, procedures, and devices, and to the formulation of public hygienic laws, all converging to the great ideal of preventive or social medicine."[2] Following the Dark Ages many factors worked to hasten the advancement of the science of public health, the most significant of which occurred during the intellectual awakening of the Renaissance. Advances in the sciences of biology, mathematics, chemistry, and physics made possible new discoveries in the theory of disease. Many other happenings indirectly stimulated the rapid development of public health. Chief among these factors were the invention of the microscope and other scientific instruments, the inauguration of the teaching of medicine and science in the medieval universities, the organization by the Church of hospitals and sick nursing, and the edicts of the Church which resulted in taking medical practice out of the hands of the monks.

Considerable stimulus was given to the advancement of public health by the destructive epidemics which ravaged Europe during the Middle Ages. These diseases were variously ascribed to comets and other astral influences, evil spirits, and the poisoning of wells by enemies of the people.

[1]F. H. Garrison, *An Introduction to the History of Medicine* (Philadelphia: W. B. Saunders Co., 1914), p. 36.

[2]*Ibid.*

The real causes, however, may be attributed to the crowded and unsanitary condition of the walled medieval towns, the poverty, misrule, and gross immorality of the people, the vagabond soldiers, students and other itinerants, and the general ignorance, superstition, uncleanliness, and promiscuous cohabitation of the masses. Among these many epidemics were leprosy, scurvy, influenza, Black Death, and syphilis. The Black Death, now thought to have been bubonic plague, destroyed more than sixty million persons in the fourteenth century alone, and syphilis was so widespread that it reached every corner of the earth and affected all classes of people. Although the destruction of life was appalling and the deleterious effects on morality and decency beyond comprehension, some good actually resulted from these terrible plagues. In an effort to control the ravages of these diseases, the Venetian Republic appointed three guardians of public health and made the first quarantine of infected areas, while in other cities there were plague ordinances, personal instructions as to prevention or treatment of disease, pest houses, and other hygienic improvements. These enactments represent a momentous step forward, inasmuch as the forces of superstition and ignorance which had ruled the world since prehistoric times were finally displaced by systematized methods of scientific disease control.

While present-day public health practices are based primarily on the science of medicine, there is scarcely an area of scientific endeavor which does not make some contribution to organized community hygiene. For indispensable guidance and assistance public health turns to the field of nursing for expert service in the visitation and care of the sick and in other technical services in relation to health and disease; to engineering for contributions in connection with sanitary water supplies, sewage disposal, drainage, indus-

trial hygiene, heating, lighting, and ventilation; to architecture for improved and beautified homes and communities; to chemistry for researches in foods, vitamins, and the application of chemistry to a great array of human activities; to physics for the foundations of applied mechanics; to biology for researches in the area of disease-bearing insects and in heredity and behavior; to psychology for contributions toward a better understanding of the activities of the individual; to sociology for facts leading to a better understanding of group behavior; to ethics for contributions in the field of morals and standards of conduct; to veterinary science for activities in relation to the control of those diseases in animals which may affect man; to economics for studies in the sequence of phenomena in the business cycle, taxation, credit, and consumer education; to political science for contributions toward a better understanding of the functions of government in relation to public health; to mathematics for methods of recording vital statistics and formulae useful in testing the soundness of hypotheses derived from numerical data; to safety engineering and construction for the removal of hazards which are destructive to life and limb; to education for the creation of a literate and enlightened population, and for instructional programs in health and physical education; and to legal science for the contribution of laws favoring hygienic living and the enforcement of these codes in the best interest of public health and welfare.

Perhaps the most effective organization to bridge the gap between scientific knowledge and its practical application in the field of public health is the United States Public Health Service. While several other departments of the federal government deal to a lesser degree with public health matters, the United States Public Health Service makes the health and general welfare of the nation its principal busi-

ness. Founded in 1789, the Public Health Service has recently been made a division of the Federal Security Administration. A study of the activities of this organization will serve to indicate the scope of the field of public health. These activities include investigations of the diseases of man; investigations of matters pertaining to the public health, including child hygiene, industrial hygiene, general sanitation, school hygiene, heating, lighting, ventilation, and milk in relation to health; investigations in the field of mental hygiene, including habit-forming drugs and drug addiction; investigations of water supplies and sewage, including pollution of streams by human and industrial wastes; demonstrations of sanitary methods and appliances in urban and rural communities; control of venereal diseases; prevention of the introduction of contagious diseases from abroad; medical examination of aliens under the immigration laws; prevention of the spread of communicable diseases in interstate commerce; regulation of the propagation and sale in international and interstate commerce of viruses, serums, toxins, and analogous products; co-operation with state and local authorities in public health matters; co-ordination of researches; collection of sanitary reports and statistics; dissemination of public health information by means of publications, conferences, lectures, and demonstrations; co-operation with other departments and services of the government in matters of public health and general welfare, including the Social Security Board, and the Departments of Labor, Interior, Commerce, State, and Agriculture. The United States Public Health Service also serves as a model for the organization and administration of state and local public health departments.

While morbidity and mortality statistics cannot be relied on to reflect all aspects of health, it is gratifying to note that

the years of painstaking devotion to the methods of science continue to produce lowered disease and death rates. No case of cholera has originated in the United States since 1911, and the last case of yellow fever occurred in 1924. During the year 1940 there was an appreciable decrease in the number of cases of most of the infectious diseases and the death rates from these diseases were the lowest in the preceding five-year period. The death rate from pneumonia was unusually low, due in all probability to the more extensive use of improved diagnostic technics and to newer methods of treatment. Mortality from each of the four principal childhood diseases: measles, whooping cough, scarlet fever, and diphtheria, has decreased markedly. Indeed, the death rate from diphtheria has declined nearly 50 per cent during the five-year period preceding 1939. Higher death rates were reported in 1939 in influenza, cancer, diabetes, cerebral hemorrhage, and heart disease. It is to be noted that cancer, diabetes, cerebral hemorrhage, and heart disease, are primarily disorders of middle adult life and old age, and the increase in deaths from these causes is largely due to the aging of the population. These are also diseases of the degenerative type. While a satisfying decline in the death rate has been made in the infectious diseases, it is possible that we are failing in our efforts to control degenerative disorders. The increase in deaths due to diseases of middle life or past is offset, however, by the improvement in infant mortality which declined 15 per cent during the period 1934–1938.

Although great advances have been made in organized public health, there are many urgent problems remaining to be solved. Since morbidity and mortality rates are purely quantitative measures of health, a group may evidence a low incidence of disease and death and yet, by qualitative measures, possess a relatively small degree of health. While

morbidity and mortality rates in the general population have never been lower than at the present time, recent statistics relating to the medical examination of registrants for selective service indicate an alarming state of health in that portion of the male population between the ages of twenty-one and thirty-six years. Up to about November 1, 1941, slightly more than two million men were examined for induction in the army. Approximately 50 per cent of this group was disqualified for military service for physical, mental, or educational reasons. Of the one million men rejected, nine hundred thousand were unacceptable for physical and mental reasons and the remaining one hundred thousand because of the lack of educational attainments equivalent to the fourth grade in school. This high rate of rejection is considerably greater than that in World War I and is of grave concern primarily because the very existence of this country is now in the hands of its young manhood. As in the case of previous wars, dental defects and visual deficiencies are the principal causes of rejection. While little of value is to be gained from a comparative study of medical examination statistics due to the variables involved, it is significant that little has been accomplished since the last war in providing more effective measures in caring for teeth, eyes, and other disabling defects. Because health deficiencies present a rather constant statistical pattern, persons familiar with health conditions among school children could have predicted fifteen years ago the probable health status of present-day draftees. Since, however, little organized effort has been made to remedy these disabling health deficiencies, the nation is now deprived of valuable manpower in times of its greatest need.

While the high rate of rejection of draftees is deplorable, there is yet another element in the situation which is seriously

hampering our war effort. Because of the lack of strength, endurance, and qualities of aggression in the men entering the service it has become necessary to retard the military training program in order to build in these men sufficient physical stamina for them to withstand the rigors of training. Modern methods of warfare demand the utmost in aggressiveness and total fitness, and it is apparent that this nation cannot survive if its functions are frustrated by a people not totally fit to operate effectively all branches of the service, both at home and on the fighting fronts. The contribution of vigorous, competitive athletic sports to a successful war effort is generally recognized. The program of competitive athletics, however, reaches only a relatively small percentage of the total population. To meet the problem school programs of physical education should be extended to include all students and considerably intensified in terms of requirements. Community programs of physical education are of equal importance and therefore need to be expanded to reach all ages and classes of the population. The unfavorable health and physical condition of men in the age group which normally should be expected to furnish the healthiest and strongest men discloses the lack of an adequate public health program looking toward the conservation of our human resources. A program of human engineering needs to be placed in operation immediately in order to meet the present emergency, and to insure against a similar situation in the years to come. The ingenuity of the scientist and engineer may combine to create the machinery of war; men, however, are not so easily moulded.

In times of war many factors combine to increase both in number and degree the problems confronting the field of public health; the present war is no exception. The concentration of troops in localities inadequately prepared to

care for men on leave, the exodus of medical doctors into the armed forces, and the hordes of itinerant workers on defense projects have created problems of medical care, sanitation, food supply and preservation, housing, schooling, and the control of various contagious diseases. The incidence of venereal diseases, for example, is sharply on the increase and one of the most difficult problems of military authorities and public health officers is to find a way to prevent the destructive forces of these diseases. Newer methods of treatment employing the sulfonamides and fever therapy are proving particularly effective in the control of venereal diseases. New laws and a stricter enforcement of those already in existence are aiding in the solution of the problem. The May Act which was passed by Congress and approved by the President in July, 1941, gives the most promise of legal control. This Act makes prostitution a federal offense in areas adjacent to military or naval establishments. In spite of all the efforts toward the prevention of the venereal diseases, however, they continue to flourish. While they are destructive in terms of time lost and possible disabling after-effects, their chief harm lies in the degrading mental and moral effects on the young manhood and womanhood of the nation.

Mental disease constitutes one of the gravest problems confronting the field of public health. On the upgrade in normal times, the incidence of mental disease increases sharply in times of national unrest. More than one-quarter of the total hospital bill of the nation is spent in the hospitalization of mental patients. The magnitude of the problem cannot be measured in terms of numbers admitted to hospitals, however, for it is much broader than the mere provision of care and treatment of those with incapacitating psychoses. Aside from these unfortunates, and in addition to the feeble-minded, the epileptic, and the criminally in-

sane, there are a vast number of borderline cases, and thousands of sufferers from mental disease who are treated outside of institutions, or who remain undiscovered and untreated. Added to this total is the number of maladjusted, unhappy, and disillusioned individuals who go to make up the complaining, faultfinding, and disgruntled element in society. It is this group which helps to fill our jails and supply the divorce courts with material from which to fashion broken homes. There is perhaps no field of public health which is more in need of study and constructive action than that of mental disease.

It has often been said that public health can be purchased. This statement may be true to the extent that it refers to the purchase of physical equipment necessary to produce sanitary living conditions; when applied to the realm of individual health knowledge and health practice, however, it cannot be substantiated. Since health is more than mere freedom from disease, much of the success of a scientific program of public health depends on the understanding and appreciation of the problems involved by those for whom the program was designed. These are matters concerning formal education, since the enlightenment of the individual is the only means of securing an enlightened public. It is in health education, therefore, that the school can make its greatest contribution to public health. Because health knowledge must be translated in terms of health practice, the school has a unique opportunity to improve the health habits of a large portion of the total population. A comprehensive school health program includes the areas of health appraisal, healthful living, and health instruction. Also included are extensive programs of physical education, recreation, and safety education. Through the activities of these areas of education, health and safety habits, health knowledge and

ideals, and healthy bodies may be developed. It is only through the forces of education that truth can replace superstition and the general public thus be enabled to distinguish between fact and fiction in all matters pertaining to health.

Although the local, state, and federal governments are spending great sums of money on programs of public health, many of the most pressing problems in this field arise out of the impoverishment of persons in the low income and underprivileged groups. In 1935–36, in the United States "14 per cent of all families (of two or more persons) received less than $500 during the year; 42 per cent received less than $1000; 65 per cent, less than $1500; and 87 per cent less than $2500."[1] While these figures must be revised upward for the year 1943, it is still safe to say that many families and individuals do not have the necessary financial resources to purchase adequate medical and dental services, nor are they able to benefit from group hospital insurance plans or similar devices. Because of the close alliance between organized medicine and the field of public health, most of the objectives of the two fields are similar and therefore overlapping. There is, however, one objective on which the two fields apparently disagree. This objective relates to the problem of providing medical service for individual members of society who are unable to provide for it themselves. According to the tenets of public health any ordinary sickness becomes a public health problem if systematized public action is necessary for providing medical services. Rendition of medical care has been accepted as a responsibility of society or government in cases of the insane, lepers, tuberculosis, inmates of public institutions, the pauper sick, and members of our armed forces. If, however, society or

[1] *Education and Economic Well-Being in American Democracy* (Washington, D. C.: Educational Policies Commission, 1940), p. 138.

government provides high grade medical care at low cost for the sick individual, then the private practitioner is likely to suffer. The high cost of medical education together with the expensive diagnostic and therapeutic services required of the private physician make it almost prohibitive for him to provide low cost medical service. The solution of this highly controversial issue is not immediately at hand; certainly the problem is one of increasing sociological importance. If the present trend in government continues, however, it is likely that we shall see a greater rather than a lesser number of instances of social or state medicine.

Today many of the scientific forces of this technological age are directed toward the creation of the machines of war. Scientific research in medicine and public health must be continued, however, since the demands of war increase the need for more exact knowledge in these areas. For this purpose those foundations, professional organizations, life insurance companies, and commercial groups, which have made valuable contributions to the cause of public health in the past, should increase rather than decrease their support during the war period. Likewise, increased aid should be forthcoming from federal, state, and local governments for purposes of research and health promotion work. Institutions engaged in medical education should expand their courses of study to include instruction for all medical students in public health practices and school health programs. There is a great need in the field of public health for scientifically educated leadership. In order to fill this need the number of medical schools preparing students for professional careers in this field should be increased. Legal methods for curbing spurious advertising should be improved and there should be a more rigid enforcement of already existing local, state, and federal laws affecting the

health of the public. Greater efforts should be expended toward the extension of public health services to rural communities and toward making existing services equally available to all persons. The school program of health and physical education needs to be improved and expanded, and a more equitable plan devised to provide medical and dental care for those persons in the community who are financially unable to purchase these services themselves. It is only through these means that we can hope to create a public health program of the quality and scope necessary to solve the health problems arising out of the war and adequate for the peace which is to follow. HARRY A. SCOTT.

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